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AUTHOR Wood, Wendy; And Others
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ABSTRACT

Research on gender differences in group performance suggests that males excel at brainstorming while females excel at human relations and integration. To investigate the relations among gender, interaction style, and task performance, 264 college students (130 female, 134 male) worked in three person same sex groups on a production task which required the generation of ideas, or on a discussion task which required group members to reach consensus concerning their evaluation of an issue. After the task, subjects completed a questionnaire assessing the quality of the group interaction. An analysis of the results showed that males and subjects assigned to production tasks reported spending more time generating solutions and less concern for harmonious group relations than females and participants working on discussion tasks. Interaction style mediated the relations between gender and group performance in that male groups generated more solutions to production tasks and lower quality solutions to discussion tasks than female groups. No gender differences were obtained in production performance when subjects worked individually and only the creativity of the discussion problems was affected by gender, such that males working individually generated more creative solutions than females. (Author/BL)

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Sex Differences in Group Interaction and Task Performance

Wendy Wood, Texas A&M University
Darlene Polek, University of South Carolina
and
Cheryl Aiken, Texas A&M University

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Correspondence should be addressed to Wendy Wood, Psychology Department, Texas A&M University, College Station, TX 77843.

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Abstract

This research assessed whether males and females differ in their group task performance and whether these differences are a function of males' and females' interaction style. Participants worked in three-person same-sex groups on a production task, which required the generation of ideas, or a discussion task, which required group members to reach consensus concerning their evaluation of an issue. Subjects then completed a questionnaire assessing quality of group interaction. Males and subjects assigned to production tasks reported spending more time generating solutions and less concern for harmonious group relations than females and participants working on discussion tasks. Given that the interaction style of males, in comparison to females, proved to be more congruent with the performance requirements of production tasks and less congruent with the requirements of discussion tasks, males were expected to show a performance advantage with the production problems and females to show an advantage with discussion problems. Indeed, male groups generated more solutions to production tasks and lower quality solutions to discussion tasks than female groups. Correlational analyses supported the idea that interaction style mediated these relations between gender and group performance. In addition, some subjects worked individually on the production and discussion tasks. No gender differences were obtained in production performance when subjects worked individually. Further, only the creativity of the discussion problems was affected by gender, such that males working individually generated more creative solutions than females.

Sex Differences in Group Interaction and Task Performance

Little is known at present about performance differences between all-male and all-female groups. Hoffman's (1965) often cited review concluded that female groups tend to perform less well at problem-solving tasks than male groups. For example, female groups were found to have fewer members who could solve the classic horse-trading problem than males (Hoffman & Maier, 1961), and to generate fewer creative solutions to a hypothetical foreman-worker conflict situation than males (Hoffman, Harburg, & Maier, 1962). In at least one of these studies, however, sex differences were found in individual subjects' performance before group interaction. The group sex differences obtained thus may be due to individual women's (vs. men's) lesser interest in, knowledge about, or motivation to perform the experimental tasks. Indeed, Hoffman (1965) reported preliminary work suggesting that male groups who performed better than female groups on the horse-trading problem (which requires quantitative skills), performed slightly worse than females on a human relations problem. It seems plausible, then, that the sex differences obtained by Hoffman and his colleagues are more indicative of the effects of sex-typed tasks on individual performance than of gender effects on group problem solving.

Yet other research in this area provides evidence suggestive of sex differences in group-level performance. Although Lamm and Trommsdorff (1973) appear to discount sex as a predictor of performance at brainstorming tasks, the two studies they cite in support of this conclusion did obtain group-level gender differences. Specifically, Bouchard, Barsaloux, and Drauden (1974) observed no consistent sex differences in individual performance at brainstorming under normal, lighted conditions, whereas in this setting

male groups were consistently observed to generate more solutions than females. Since the magnitude of this group sex difference varied somewhat across experimental conditions, the analyses also yielded several interactions between sex and other experimental variables. In addition, Rotter and Portugal (1969) reported males in groups more effective at brainstorming than females, although this finding cannot clearly be attributed to group-level sex effects since a difference in the same direction was obtained for subjects working individually. Finally, we were able to locate a third study which did not report group performance scores yet found that in individual brainstorming performance, women equalled or excelled men (Lindgren & Lindgren, 1965). Although the findings of these three studies are open to a number of interpretations, they are consistent with the idea that in groups, males tend to perform better at brainstorming than females, yet as individuals, the sex difference is not as strong or widespread.

Another suggestive group-level sex difference was obtained by Fennell et al. (1978) with a desert survival task. Participants in this study first individually listed the items most useful for survival in the desert, and then performed this task again in small groups. Groups had to reach unanimous decisions through consensus, that is, they could not vote. Subjects' rankings of items were compared with those of experts, and accuracy scores were calculated from this comparison. Although the mean highest accuracy scores were identical for males and females when they worked individually, female groups demonstrated greater gains in accuracy through group discussion than male groups. With this task, then, female groups, compared with males, appeared better able to combine the resources of individual members into a composite score.

In sum, research on gender differences in group performance suggests that male groups may possess a performance advantage relative to females at brainstorming tasks, and female groups may possess an advantage when the task requires that

members reach consensus.

Effects of Gender on Group Interaction

To understand why sex differences might occur in group performance, it is helpful to consider the implications of gender for group process. According McGrath (1964), gender should function like other "input variables," such as group size, to affect interaction, and interaction should subsequently affect "output variables" like group productivity. Although some attempts to validate the input-process-output relationship have been unsuccessful (e.g., Hackman & Morris, 1975), other work has provided suggestive support for this approach (Katzell et al., 1970; Sorenson, 1973).

This explanation for the performance sex differences noted above, then, focuses on the mediational role of males' and females' interaction. Evidence for the first step in this analysis, the link between gender and interaction style, was documented in a recent meta-analysis of prior research on group interaction (Carli, 1982). It appears that in same-sex groups, males engage in more task-oriented behavior (e.g., giving suggestions, asking for others' opinions) than females, and females engage in a greater amount of positive social-emotional behavior (e.g., agreeing with others, dramatizing) than males.

There is little direct evidence, however, concerning the second link in the analysis, the relation between sex differences in members' style of interaction and group performance. Men's and women's interaction style seems likely to affect performance primarily when: (a) a particular kind of interaction tends to enhance effectiveness at a task, and (b) sex differences appear in the frequency with which members engage in this mode of interaction. Given that production tasks, such as brainstorming, which require the generation of ideas, appear to call for relatively high levels of task-oriented behavior (Morris, 1966), males' tendency to engage in more task-oriented activity than females could explain why male (vs. female) groups

appear to perform better at brainstorming.

Further, since discussion tasks, which require members to reach consensus concerning the evaluation of an issue, appear to call for high levels of process, as opposed to task, activities (Morris, 1966), females' interaction style could explain why female groups have been found to perform better at tasks requiring consensus than males (Fennell et al., 1978). Females' performance advantage at such tasks might be most noticeable in the quality of their solutions: According to Kabanoff and O'Brien (1979), high quality discussion task products are likely to result from the systematic development of a variety of perspectives. Females' (vs. males') higher levels of social-emotional activity might increase the likelihood that all members contribute their various skills and abilities to task solution. If these contributions are adequately developed, female groups should generate better quality discussion solutions than males. Consistent with this idea, members of female groups tend more than males to contribute equally to the group product (Anderson, 1961), and relatively equal task-oriented contributions may enhance performance at tasks requiring consensus (Fennell et al., 1978).

The above analysis is generally consistent with Steiner's (1972) work on the relation between group process and productivity. A group's actual productivity, according to Steiner, will aproach its potential productivity when the actions of group members correspond to the interaction pattern demanded by the task. If males' (vs. females') interaction style more closely approximates that required by production tasks, then male groups' performance would be expected to be better than females'. Similarly, if females' (vs. males') interaction style is closer to that required by discussion tasks, they should show a performance advantage in this context.

The Present Research

The present studies were designed to explore our ideas concerning the

relations among gender, interaction style, and task performance. Subjects in this research worked individually or in three-person same-sex groups on discussion or production tasks.

The specific content of the experimental tasks was carefully selected so that it did not favor the interests or expertise of one sex over the other. Therefore, gender differences in performance were not expected to occur in the conditions in which subjects worked individually. When subjects worked in groups, however, we anticipated that all-male groups would generate more solutions to the brainstorming tasks than females and all-female groups would generate higher quality solutions to the discussion problems than males. Thus, the performance predictions for each task involved an interaction between subject gender and the individual vs. group performance setting.

Although we did not directly observe group members' interaction style in this experiment, at the end of the session subjects who worked in groups responded to questionnaires assessing quality of interaction. We anticipated that subjects' ratings would yield sex differences consistent with the research that directly observed members' interactions (cf. Carli, 1982): Female groups were expected to report greater amounts of interpersonally-oriented activity than males and male groups to report more task-oriented activity than females. Further, consistent with Morris' (1966) work concerning task effects on interaction, production task performance was expected to require more task and less social activity than discussion performance.

Finally, correlational analyses were expected to reveal that males' interaction style, compared with females', facilitated performance at production tasks and females' interaction, in comparison to males', facilitated performance at discussion tasks.

Method

Subjects

A total of 130 female and 134 male psychology students participated in a study ostensibly concerned with problem solving.

Procedure: Individual Performance Setting

Subjects reported to a classroom in groups of 15 to 20 people and were seated at individual desks. The experimenter explained that subjects would complete several problem-solving tasks. It was emphasized that subjects would be evaluated on how well they did at these tasks and their performance would be compared to that of other subjects in the experiment. It was thus important that participants performed as well as possible.

Depending on whether subjects were assigned to work on discussion or production tasks, the instructions indicated they were to write down "the best solution you come up with" or "as many solutions as you come up with" concerning each of three problems (see below). Subjects were then shown the answer sheets on which they were to write their solutions. The problem was always stated at the top of the sheet. For discussion tasks, the rest of the sheet was blank, and for production tasks, the rest of the sheet contained boxes in which to list individual solutions. Additional sheets were available for production tasks, if subjects generated more answers than could fit on one page.

After explaining the procedure, the experimenter presented a sample problem along with possible solution(s) for a discussion or production task, whichever was appropriate. She then gave subjects the first problem, set a timer, and placed it in subjects' view so they would know when ten minutes had elapsed. At the end of ten minutes she gave subjects the second problem. This procedure was repeated until three production or three discussion problems were completed.

Finally, subjects were debriefed, given credit slips, and excused.

Procedure: Group Performance Setting

Subjects in the group setting reported to a small lab room in same-sex groups of three, and were seated around a table in the center of the room. The experimenter introduced group members to each other and gave each a name tag to wear.

The description of the tasks was similar to the individual performance condition except that group, rather than individual, performance was stressed and the experimenter left the room while subjects worked on each of the assigned problems. After three problems had been completed, subjects were separated from each other and individually filled out a questionnaire on "how things went in your group" (see below). Finally, subjects were debriefed, given credit slips, and excused.

Problems

The problems were carefully selected to ensure that they did not favor one sex over the other: Pretesting established that males and females did not differ in their perceptions of how knowledgeable or interested they were in each of the problems or how much they had thought about them in the past. The three problems, presented in the following order, concerned: (a) the personal characteristic(s) likely to make someone a successful person, (b) the factor(s) college students should consider when deciding on a major, and (c) within one's price range, the feature(s) to consider when buying a house.

Scoring of Task Performance

The responses of each group or individual were typed verbatim onto answer sheets, and coders evaluated the typed version.

Production tasks. For the group performance setting, two female coders independently judged the number of nonredundant solutions produced to each problem (r = .98). For the individual performance setting, subjects were randomly assigned to three-person same-sex nominal groups. The coders then judged, for each

three group members $r = .79$).[1] Given that task products consisted of lists of one- and two-word solutions, they proved difficult to evaluate reliably for attributes other than length.

Discussion tasks. Task products were evaluated according to the Q-Sort procedure developed by Hackman, Jones, and McGrath (1967). Although this procedure was developed with 18 separate scales, a number of these were inappropriate for the present tasks. The nine dimensions employed concerned whether products were short, the actual number of words, the amount of detail, whether bizzare,[2] original, usual, stylistically well-integrated, choppy, and understandably presented. Two independent groups of coders, each composed of one male and one female, evaluated task products.[3] Coders believed all products were generated by groups. Reliability for the nine scales ranged from $\underline{r} = 1.00$ (for number of words) to $\underline{r} = .71$ (for well-integrated and understandably presented), with a mean of $\underline{r} = .92$.

To allow comparison among the product dimensions, the scale directions for shortness, lack of detail, usual, and choppiness were reversed. Ratings on all scales were then transformed to $\underline{z}$ scores. The pattern of correlations among the product dimensions[4] generally replicated those reported by Hackman, Jones, and McGrath (1967): for shortness, number of words, and detail, $\underline{r} = .84$; for unusual and original, mean $\underline{r} = .69$; for lack of choppiness, well-integrated, and understandably presented, mean $\underline{r} = .45$. These dimensions were then averaged into three indices representing length, creativity, and presentation style, respectively.

Perceptions of Interaction: Group Performance Setting

Task-oriented activity. Subjects indicated, by checking boxes labeled with either "yes" or "no", whether the assigned task required generation of a large number of solutions and then whether the task required discussion and evaluation of possible solutions. Also, subjects indicated, by circling a number from 0 to 100,

the percent of time their group spent generating, but not evaluating, solutions, and then the percent of time spent evaluating the solutions that were generated.

Defense of own opinion. On 15-point scales, subjects rated how frequently they defended the solutions they proposed and then how frequently they had to compromise with the rest of the group in order to solve the task.

Subjects' motivations. On 15-point scales, subjects rated (a) their responsibility for a comfortable group atmosphere, (b) the importance of other members liking the subject, (c) the importance of other members getting along well, and (d) the importance of a comfortable group atmosphere. The first three items proved to be correlated (*r*s ranged from .42 to .66) and were combined into an index representing concern for group harmony.

Subjects rated on 15-point scales how important it was that they, personally, contributed to the solution of the problems and how important it was that their group performed well. These two ratings proved to be correlated (*r* = .48) and were combined into an index representing concern for effective task performance.

Other members' orientation. As suggested by Ridgeway (1981), whether other members are perceived to be group-oriented vs. self-oriented can affect interaction. Subjects were told that "behavior is group-oriented if it reflects an interest in what the group is doing and a desire to complete the task. Behavior is self-oriented if it reflects an 'I don't care' attitude or interest in oneself, rather than others." Subjects rated on two 15-point scales the extent to which each of the other members was "primarily self-oriented" vs. "primarily group-oriented." These ratings proved to be correlated (*r* = .50) and were combined into an index.

Pleasantness of working with others. Subjects rated on 15-point scales how much they enjoyed working on the task and how helpful other group members were in solving the problems.

Equality of participation. On two 15-point scales, subjects rated the extent to which members of their group took turns talking and the amount of time each subject spent talking compared with the other group members. Subjects also indicated, by checking boxes labeled with either "yes" or "no," whether one group member emerged as a leader.

Results

Perceptions of Group Interaction

To test for differences among groups, analyses were initially calculated including a term representing groups within experimental treatments. This groups term was not significantly different from the term representing random variability among subjects, and error terms were recalculated pooling individual and group variability (cf. Anderson & Ager, 1978). The hypotheses were thus explored by Sex of Subject (male vs. female) X Type of Task (production vs. discussion) analyses of variance and appropriate contrasts.

Task-oriented interaction. Manipulation checks revealed that the type of task had the anticipated effects on task-oriented activities. Subjects assigned to production tasks were more likely to endorse the idea that the task required the generation of large numbers of solutions (69 subjects checked "yes" vs. 21 checked "no") than subjects assigned to discussion tasks (31 subjects checked "yes" vs. 59 checked "no"), X^2 (1, N = 90) =30.82, $p < .001$. Also, subjects assigned to discussion tasks were more likely to endorse the idea that the task required the discussion and evaluation of solutions (82 subjects checked "yes" vs. 8 checked "no"), than subjects assigned to production tasks (63 subjects checked "yes" vs. 27 checked "no"), X^2 (1, N = 90) = 11.49, $p < .001$. In a similar manner, subjects working on production (vs. discussion) tasks reported spending a greater percent of time generating, but not evaluating solutions, F (1,176) = 76.41, $p < .001$, and a smaller percent of time evaluating the solutions that were generated, F (1,176) =

44.31, $p < .001$ (see Table 1).

INSERT TABLE 1 ABOUT HERE

Paralleling these task effects, males, compared with females, reported spending more time generating solutions, F (1,176) = 3.77, $p = .05$, and reported a slight tendency to spend less time evaluating solutions ($p < .15$). It is possible that males did not report more solution evaluation than females because evaluation includes both task-oriented activity, such as offering opinions, as well as social-emotional activity, such as agreeing or disagreeing (cf. Bales, 1971). It could be, then, that males' high scores on this measure reflect a large amount of opinion generation and females' high scores reflect more agreement and disagreement with others' ideas.

Negotiation among group members. Further evidence of the kind of group interaction associated with each task was provided by discussion (vs. production) task subjects' reports that they were more frequently forced to defend the solutions they proposed (Ms = 9.80 vs. 8.33 for discussion and production tasks, respectively, $p < .01$). Discussion task subjects also reported that they were somewhat more likely to compromise with the rest of the group in order to reach a solution than production subjects (Ms = 7.69 vs. 6.91, for discussion and production tasks, respectively, $p < .11$).

Group members' motivations. As anticipated, females reported a greater concern for harmony in group interaction than males, F (1,176) = 12.15, $p < .001$. Paralleling this sex difference, subjects working on discussion (vs. production) tasks reported greater concern for harmony, F (1,176) = 5.07, $p < .03$. No effects were obtained in the analysis on importance of a comfortable group atmosphere.

In addition, female subjects, compared with males, rated the other group members as more motivated by group-oriented than self-oriented concerns, F (1,176)

= 7.50, $p < .01$, and as being more helpful in solving the problems, F (1,176) = 4.86, $p < .03$. Females (vs. males) also reported a higher level of enjoyment working on the tasks ($p < .001$).

Somewhat unexpectedly, females reported that it was more important that their group perform well than males ($p < .001$). Given the high correlation between concern for harmony and for performance ($r = .87$, $p < .001$), these two variables appear to tap similar constructs, most likely both reflect subjects' desire for favorable group outcomes.

Participation rates. Female subjects reported that their groups were somewhat more likely to take turns talking than male subjects ($p < .06$). No effects were obtained in the analyses on the amount of time subjects spent talking relative to other group members or whether there was one person in the group who acted as a leader.

Production Tasks: Performance

The hypotheses were explored by a Performance Setting (individual vs. group) x Gender Composition of Group (male vs. female) x Brainstorming Problem (problem 1 vs. problem 2 vs. problem 3) analyses of variance with repeated measures on the last factor.[5]

As indicated in Table 2, males generated more solutions than females, F (1,46) = 9.25, $p < .01$.

INSERT TABLE 2 ABOUT HERE

Although the predicted interaction between gender and setting did not reach conventional levels of significance, F (1, 46) = 2.19, $p < .15$, planned comparisons revealed that, as anticipated, sex was not a predictor of performance in the individual performance setting ($F < 1$). Only in the group setting did males

generate significantly more solutions than females, F (1, 46) = 4.26, $p < .05$. These results, then, provide support for our hypotheses. The lack of a sex difference in the individual setting suggests that males and females had equal ability and motivation to perform the experimental task. The sex difference in the group setting is thus likely to be a function of interaction among group members: Males' interaction style may have facilitated performance at brainstorming relative to females' interaction.

Consistent with previous work on brainstorming (cf. McGrath, 1978), performance scores in the individual setting were higher than the group setting ($p < .001$).

Finally, several effects were obtained due to brainstorming problems. A main effect ($p < .001$) revealed that problem 3 elicited a greater number of solutions than either problems 1 or 2 ($ps < .01$), and problem 1 elicited a greater number of solutions than problem 2 ($p < .01$). More interesting, a significant Problem X Setting interaction ($p < .001$) revealed that this ordering of problem solutions was obtained only for the individual performance setting ($p < .001$). For the group setting, the number of solutions generated to problems 1 and 2 did not differ. The comparatively low score on problem 1 in the group setting may be due to the competing demands of group organization and task peformance. The time and energy subjects in the group setting initially devoted to becoming acquainted and to organizing group interaction (e.g., choosing a member to write down the solutions) most likely interfered with the generation of solutions to the first problem. By the start of the second problem, however, groups had most likely achieved a relatively stable organization and their subsequent performance thus paralleled that of subjects working individually. This finding is particularly interesting because it suggests that high levels of process activity, whether due to females' concern for group harmony or to initial organizational requirements, impaired

performance at brainstorming.

Correlational analyses. We anticipated that the effects of sex on group performance would be mediated by males' and females' interaction style. Although we did not directly observe group members' interaction, subjects' ratings of group process provide an indirect means of evaluating this causal sequence. The first step in the causal link is supported by the relations noted earlier between gender and perceptions of group interaction. To explore the second step in the sequence, partial correlations controlling for effects of gender were calculated between task performance[6] and ratings of interaction. According to this analysis, performance was facilitated when the group spent a large amount of time generating solutions (r = .39, $p < .05$), and tended to be impaired when members expressed high concern for group harmony (r = - .36, p = .05), reported frequent turn taking (r = -.25, $p <$ .20), or reported high levels of compromising and evaluating solutions (rs = -.19 and -.16 respectively, n.s.). Productivity was not associated with any of the other ratings of interaction.

Discussion Tasks: Performance

The three product dimensions, length, creativity, and presentation style, were subjected to a Performance Setting (individual vs. group) X Subject Gender (male vs. female) X Discussion Problem (problem 1 vs. problem 2 vs. problem 3) multivariate and univariate analyses of variance with repeated measures on the last factor.

As anticipated, the interaction between gender and setting in the multivariate analysis was significant, Hotelling $T^2(3,45) = 6.06$, $p < .01$ (see Table 3). Simple effects tests revealed that in

INSERT TABLE 3 ABOUT HERE

the group setting, females generated higher quality solutions than males, Hotelling T^2 (3,45) = 4.85, $p < .01$, whereas no sex difference was observed in the individual setting, Hotelling T^2 (3,45) = 1.88, n.s. Univariate analyses yielded results consistent with these findings, indicating that in the group setting females, compared with males, generated more creative F (1,47) = 6.27, $p < .02$, better presented, F (1,47) = 6.81, $p < .02$, and slightly longer solutions, F (1,47) = 3.29, $p < .10$. In the individual setting, however, the only significant effect for gender was the finding that males generated more creative solutions than females, F (1,47) = 4.01, $p = .05$.

In addition, subjects working in the individual setting appeared to generate better quality solutions than those in the group setting, Hotelling $T^2(3,45) = 5.23$, $p < .005$. The univariate tests revealed, however, that this effect was due solely to individuals writing longer solutions than groups ($p < .001$).

Finally, a marginally significant Gender X Problem interaction, Hotelling $T^2(6,42) = 2.05$, $p < .09$, proved to be due to the fact that women generated slightly longer solutions than men to the third problem, which concerned attributes of a house ($p < .09$), yet no sex difference was observed for the other two problems ($Fs < 1$).[7]

Correlational analyses. To explore whether the relation between sex and quality of group performance was mediated by males' and females' interaction style, partial correlations controlling for the effects of gender were calculated between the group product dimensions[8] and subjects' ratings of interaction. According to this analysis, longer solutions tended to be obtained when members were highly concerned with performing well ($r = .31$, $p < .11$) and when they reported a high level of compromise ($r = .16$, n.s.). Also, more creative solutions tended to be obtained when members expressed high levels of concern for group harmony ($r = .31$, $p < .11$). Finally, presentation style tended to be enhanced when members took

turns talking (r = .19, n.s.) and impaired when the group spent a large amount of time generating solutions and, somewhat surprisingly, when members expressed high levels of concern for group harmony (rs = -.30 and -.35, respectively, ps < .12).

Discussion

The results of these two experiments are generally consistent with our predictions. No significant sex differences in performance were obtained when subjects worked individually, most likely because the content of the experimental tasks did not favor the interests or expertise of one sex over the other. In contrast, when working in same-sex groups, males generated more solutions than females to production tasks, whereas females generated higher quality solutions than males to discussion tasks. Our explanation for these group performance findings relies on the nature of group interaction. Specifically, it was anticipated that effective performance would depend on the match between the interaction style required by a particular task and the interaction style of male and female groups.

Subjects' ratings of group interaction are informative concerning the interaction requirements of each task. Production tasks engendered more solution generation than discussion tasks, also less evaluation of suggested solutions, less negotiation, and less concern for positive relations among group members. Although these self-reports provide only an indirect assessment of interaction style, they are consistent with Morris' (1966) direct observations of interaction, which suggested that performance of production tasks requires more task-oriented and less process activity than performance of discussion tasks.

Subjects' ratings of interaction further revealed a number of sex differences. In general, male groups appeared to engage in somewhat more task-oriented, and less process, activities than females. Males, in comparison to females, spent more time generating solutions, reported less concern for group harmony, viewed fellow group

members as more motivated by self-oriented than group-oriented concerns as well as less helpful in completing the assigned tasks, reported less enjoyment working on the tasks, and indicated that group members were somewhat less likely to take turns talking. Again, these self-reports are consistent with the sex differences obtained through direct observation of interaction in same-sex groups (cf. Carli, 1982).

It appears, then, that males' (vs. females') relatively high levels of task, as opposed to process, activities are congruent with the interaction style associated with production performance. In contrast, females' (vs. males') relatively high levels of process, as opposed to task, activities are congruent with the interaction associated with discussion performance.

Evidence that aspects of interaction style mediated, in part, the relation between gender and productivity was provided by correlational analyses. Partial correlations, controlling for the effects of gender, between task performance and interaction ratings were generally consistent with the idea that production performance was facilitated by one kind of task-oriented behavior, generating solutions, but impaired by a concern for harmonious social relations. Also as anticipated, presentation style of discussion products was somewhat impaired by a focus on generating solutions. Further, concern for effective performance tended to enhance the length of discussion solutions. The relation between discussion performance and concern for group harmony is more difficult to interpret given that, as expected, high concern tended to enhance the creativity of solutions but, surprisingly, also tended to impair their presentation style.

These findings, then, provide some support for the idea that gender affects group performance because of its effect on interaction style. Evidence for this causal framework was obtained most clearly with the production tasks, although some suggestive support was also obtained with the discussion tasks. Perhaps the

strongest evidence was obtained with production problems because the effective mode of interaction is narrowly prescribed with this kind of task. High performance scores appear to result from solution generation and appear to be impaired by almost any other activity, including social-emotional behavior, negotiation among members, and solution evaluation, although the relations between performance and these latter two activities were weak. Effective discussion performance, in contrast, could potentially be achieved through more than one route. Some groups may have attempted to build the first proposed solution into an effective answer, thus focusing relatively heavily on offering opinions and reacting to others' ideas, whereas others may have considered several possible solutions and decided on the best one, thus focusing relatively more on compromise and negotiation. Future tests for the mediational role of interaction might profitably use tasks with a limited range of effective interaction styles.

Content of Interaction and Group Structure

Subjects' ratings of interaction are informative concerning its content, but they do not identify how the groups went about solving the assigned tasks. Each group member might have focused his or her contributions in one area, thus becoming the group's specialist in that domain, or members may have contributed to all aspects of interaction and task completion. Also, in some groups, members may have participated in relatively equal amounts and in others, one or two members may have been responsible for the majority of interaction.

Although little is known about specialization of roles in male and female groups, there is some evidence that power relations vary with group gender. According to research directly observing interaction, males are more likely than females to form a dominance hierarchy (Aries, 1976; Fennell et al., 1978). The evidence concerning males' and females' group structure is somewhat mixed in the present research. Consistent with the idea that females are less likely than males

to form a dominance hierarchy, females reported taking more turns talking. However, males and females did not differ in their reports of the frequency with which one member assumed a leadership position. Further, for groups in which more than one member indicated that the group had a leader, agreement among members concerning the individual nominated did not differ for males (100% agreement) and females (96% agreement).

It seems plausible that the structure of relations among group members would be associated in some way with content of interaction. The structure a group develops might direct interaction content; for example, a hierarchical structure might be responsible for males' (vs. females') greater amounts of task-oriented interaction. Alternatively, interaction content might facilitate certain structures so that, for example, females' (vs. males') higher levels of positive social activity might reduce the extent to which members assume specialized roles. Relations between the content of interaction and group structure, however, cannot be assessed in the present work and would best be addressed through future research which directly observes interaction.

Origin of Gender Differences in Interaction

Gender differences in group members' interaction style can be explained from a variety of theoretical perspectives. Although the present research was not designed to address the origins of interaction differences, considering possible determinants is helpful in understanding the obtained gender differences in performance.

According to one approach, behavioral sex differences are a function of sex-typed attributes and personality traits. Males and females are thought to acquire particular attributes as a product of socialization pressures that apply differentially to boys and girls. Men's greater level of task-oriented activity and lesser amount of positive social activity than women might thus be behavioral

manifestations of masculine (vs. feminine) personality. This explanation for men's and women's interaction while engaged in the relatively structured tasks in the present research appears promising given that gender-differentiating traits have been found to predict amount and quality of interaction in mixed-sex dyads working on less structured tasks, such as a getting acquainted exercise (Ickes & Barnes, 1978; Jose & Wong-McCarthy, 1983).

An alternative perspective emphasizes men's and women's social roles as the primary factor underlying behavioral sex differences. Research in this tradition has focused primarily on the greater status, or access to power, inherent in the roles traditionally filled by men than by women (Lockheed & Hall, 1976; Meeker & Weitzel-O'Neill, 1977). Yet the sex differences in interaction style which are the focus of the present investigation occur in settings in which men and women occupy exactly the same social role, that of a participant in a newly formed group. Behavioral sex differences in such settings are thought to arise from the tendency for sex to function as status cue (Berger et al., 1980; Eagly & Wood, 1982). Status cues lead people to have expectations about each others' behavior so that people who have characteristics (e.g., maleness) ordinarily associated with higher status roles in our society are assumed to be more competent (Berger et al., 1980) and to possess greater legitimate authority (Eskilson & Wiley, 1976; Fennell et al., 1978). These aspects of status correspond to what French and Raven (1959) labeled expertise and legitimate power.

Given that members of same-sex groups cannot be differentiated in terms of gender-based expertise (Berger et al., 1980), status inferences in this setting are likely to stem primarily from beliefs concerning men's and women's legitimate authority (Fennell et al., 1978). Members with low authority may not appear to themselves or to others as having authorization from the larger organizational system to assume high status positions. In the case of groups in the laboratory,

this system is represented by the experimenter. In same-sex groups, then, women (vs. men) may function as lower status members.

Since leadership status in small groups is positively associated with high participation rates, particularly high levels of task-oriented responses (Stein & Heller, 1979), men's tendency to engage in these kinds of activities can be understood as one aspect of their high group status. High levels of task-oriented behavior may be a consequence of high status, since people at the top of a status hierarchy are allowed to engage in such activities with little fear of censorship from the rest of the group, as well as an antecedent of high status, since one method of attaining a high level position is to have your suggestions and ideas adopted by others. Women's (vs. men's) lower levels of task-oriented responses can similarly be explained in terms of their relatively low status.

Sex differences in group members' positive social-emotional behavior may also be a function of the perceived link between gender and status. If low status group members want their ideas to be adopted by the group, thus enhancing their own status, they must convince others that their contributions are motivated by group-oriented, rather than self-oriented, concerns (Ridgeway, 1978, 1981). According to this view, the more a contribution is accompanied by positive social-emotional acts, the more likely it is to be labeled group-oriented in intent. In order to be influential, then, women, as low status members, may be required to engage in more positive social-emotional behavior than men, as high status members.

These two explanations for behavioral sex differences, one focusing on the different traits possessed by men and women and the other on inferred sex differences in status, may apply primarily to gender differences that are obtained in the performance of newly formed groups, including laboratory groups. In contrast, in most organizational contexts, any effects of gender on behavior are likely to be a function of the position men and women hold in the organizational

hierarchy (Kanter, 1977). In fact, it seems plausible that the variety of other cues available in organizational settings, such as experience and job-related expertise, may prove at times more immediately relevant to job performance than gender (Eagly, 1983). Gender's effect on interaction and performance thus may often be diluted by these other cues present in organizational settings.

Conclusion

The present research provides support for the idea that male groups perform better than females at tasks requiring the generation of a large number of solutions and female groups generate better quality solutions than males at tasks requiring members to reach consensus. Further, group interaction appears to play an important role in these performance differences. Male groups' performance advantage at production tasks appears to be due to their lesser concern for effective group process and greater amount of task-oriented activity than females. Females' performance advantage at discussion tasks can less clearly be attributed to interaction style, yet the data suggest that females' (vs. males) lesser focus on generating solutions enhanced presentation style, and their greater focus on interpersonal concerns enhanced solution creativity.

The above analysis may also have implications for task performance of mixed-sex groups. Given that men, compared with women, appear to engage in more task-oriented and less social activity in mixed-sex as well as same-sex groups (cf. Carli, 1982), the number of men in a group in relation to the number of women might affect the relative amounts of these two activities and thus the group's effectiveness at production and discussion tasks. Male majority groups would be expected to generate more solutions to production tasks and lower quality solutions to discussion tasks than female majority groups.

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Footnotes

1. One randomly chosen male subject in the individual performance setting was deleted from the analyses in order to form a total of ten male and ten female three-person nominal groups.
2. All products were judged non-bizarre, and thus this scale was dropped from the analyses.
3. A female coder in one group was not able to complete the full set of tasks. One-third of the ratings concerning originality, usualness, and all of the ratings concerning choppiness were conducted with the remaining male coder working independently from the other group. Inter-rater reliability, calculated between the two groups, was not impaired by this change.
4. Correlations among the scores were calculated separately for each problem and then averaged across problems to form one score.
5. Although all of the data for the group performance conditions were collected at a large, urban midwestern university, half of the individual conditions were conducted at Texas A&M. The analyses on task performance for the individual conditions were thus initially calculated including a term representing the location at which the data was collected. No differences were obtained due to location, and this term was dropped from the analyses.
6. For the correlational analyses, a composite productivity score was formed for each group by averaging the number of solutions generated to the three brainstorming problems.
7. The comparisons within each problem utilized a compromise error

term based on the average of the between- and within-subjects error terms (Winer, 1971, p. 563).

8. For these analyses, composite product dimension scores for each group were formed from the mean of the three discussion solutions' length, their creativity, and their presentation style.

Table 1

Mean Perceptions of Group Interaction as a Function of Subjects' Gender and Type of Task

	Production Task		Discussion Task	
	Males	Females	Males	Females
Percent of time group generated solutions	76.00	66.67	44.89	41.78
Percent of time group evaluated solutions	30.69	34.67	51.33	56.67
Concern for group harmony	9.96	11.21	10.81	11.81
Importance of effective performance	10.73	11.78	10.84	12.38

Note. Higher numbers represent more time devoted to generating solutions, to evaluating solutions, and greater concern for harmony and for effective task performance. Cell ns are 45.

Table 2

Production Task: Mean Number of Solutions Generated to Each Problem as a Function of Group Gender and Performance Setting

	Group Performance Setting		Individual Performance Setting	
	Male real groups	Female real groups	Male nominal groups	Female nominal groups
Problem 1	18.13	15.40	28.70	28.00
Problem 2	17.33	13.47	22.40	20.30
Problem 3	22.67	17.67	35.60	34.40

Note. Higher numbers represent a greater number of solutions per group. Cell ns are 15 in the group performance settings and 10 in the individual settings.

Table 3

Discussion Task: Mean Ratings of Task Products Across the Three Problems as a Function of Gender and Performance Setting

Variable	Group Performance Setting		Individual Performance Setting	
	Males	Females	Males	Females
Length	-.621	-.092	.508	.256
Creativity	-.400	.245	.294	-.188
Quality of presentation	-.247	.317	.060	.184

Note. Higher numbers represent longer and more creative solutions, and higher presentation quality. Cell ns range from 10 to 15.